neutralisation of their injurious products increases, no doubt some of the now malarial swamps will be converted into thriving colonies; and so is it with physiology, when by further experiment our knowledge of the *modus operandi* of the change from the physiological to the pathological is more complete, many facts now apparently barren will bear fruit a hundred-fold.

Those who apparently with such unctuous satisfaction point to the inability of even modern therapeutics to cope successfully with certain deadly diseases, are surely supplying an argument for more experimentation, and not for less. If medicine has not derived the full benefit possible from physiological discovery, it will do so later on. But what is regarded by the anti-vivisectors as a benefit? One of them asks quite recently, and apparently quite seriously, what benefit has accrued to medicine from a knowledge of cerebral localisation.

Mr. Paget deals with many points in detail which have formed the text of many of the more or less scurrilous essays of both varieties of antivivisectionists; he succeeds in showing that their case is only skin deep, and that when care and some erudition are applied to the elucidation of the individual instance, the facts appear in quite another light.

The last part of Mr. Paget's work is devoted to the Prevention of Cruelty to Animals Act itself. He argues, with some reason, that however efficacious the Act might have been in 1876, since then a new science, bacteriology, has practically arisen. This science for the elucidation of its problems requires a special kind of technique, simple enough, but for which the Act is ill adapted. At the conclusion of this chapter some interesting accounts are given of questions in the House of Commons concerning the working of the Act, and some interesting letters reproduced, emanating from antivivisectors, and threatening her Majesty's ministers with political destruction if they failed to use their influence against experiments on animals. The President of the Board of Agriculture seems especially to have incurred their wrath.

OUR BOOK SHELF.

Cyclopedia of Classified Dates. By Charles E. Little. Pp. vii + 1454. (New York and London: Funk and Wagnalls Co., 1900.)

IT may be doubted whether this bulky volume is of sufficient value to justify the immense amount of labour that must have been spent in its compilation. There are no less than 95,000 entries of important (and unimportant) historical events, classified geographically, chronologically, and according to their nature, so that the where, when and what of any event can be discovered. The volume is intended to be a universal history, a biographical dictionary, a geographical gazetteer and many other books combined; in short, an omniscient and international Domesday Book. The only parts with which we have any concern are the divisions of science and nature included among several other groups of events recorded for each of the seventy-nine geographical divisions, which are arranged in alphabetical order. Many of the entries appear vague and trivial, and some are misleading, if not actually incorrect. As instances of information which comes under one or other of these criticisms, the following may be cited:—1089, a widespread earthquake is felt; 1737, Dr. James Bradley discovers the variation (*sic*) of the earth's axis; 1783, Walker produces ice in summer by means of chemical mixtures; 1783, Herschel proves the binding (*sic*) rotary motion of the stars; 1787, quicksilver is frozen without the aid of snow or ice; 1827, the spectrum analysis is worked out by Herschel; 1848, William Lassell discovers the eight (*sic*) satellites of Saturn; 1852, Sir William Thompson (*sic*) discovers the dissipation of energy; 1861, Mr. Thompson, of Weymouth, photographs the bottom of the sea; 1867, nitrous oxide gas (laughing gas) is introduced; 1881, telephotography is invented by Shelford Bidwell; 1890, the bones of a hippopotamus are found imbedded in clay; and there are many others.

But the sins of commission are as nothing in comparison with those of omission. The only events recorded under science and nature in 1894 are the meeting of the British Association, and the departure of the Jackson-Harmsworth polar expedition; in 1893, an earthquake and a flood; in 1892, two earthquakes; and in 1891, the meeting of the international congress of hygiene and demography.

Judging from these facts, no serious attempt has been made to trace the progress of science in any of its branches in latter years. From our point of view, therefore, the book is of little value. In a charitable spirit we trust its merits in other sections help to make up its deficiencies in those referring to scientific matters.

Justus von Liebig und Christian Friedrich Schönbein. Briefwechsel, 1853-1868. By Georg W. A. Kahlbaum und Eduard Thon. Pp. xxi + 278. (Leipzig: Johann Ambrosius Barth, 1900.)

THE correspondence of Faraday and Schönbein, which was noticed in a former issue (Feb. 8), finds a companion volume in the work before us, which comprises 133 letters covering a period of fifteen years. Of these letters, eighty-four are from the pen of Schönbein. The same care as regards editing and annotation which was observable in the previous volume is a conspicuous feature of the present work.

The subjects dealt with by Schönbein are chiefly those which are referred to in his letters to Faraday, more especially ozone and the work arising from his investigations of that substance. Some of the letters are more or less personal and political, and will be found very interesting reading. Liebig's letters also are replete with topics of interest in the history of chemistry, and will repay detailed consideration.

Among the subjects dealt with are fermentation, food preservation, meat extract, and agricultural chemistry. It must be remembered that the views concerning fermentation, and the bearing of chemistry upon agriculture, were at that period in the polemical stage, and this imbues Liebig's statements with special interest. Both writers also from time to time soar from the commonplace recital of facts and discoveries into the higher regions of speculation and philosophy. Liebig's views on the place of Bacon in philosophy and science are referred to by Schönbein with approval (p. 166). Schönbein's views on theory as a stimulus to new discovery (p. 216) will also commend themselves to the majority of readers.

It will be gathered from this brief notice that the volume under consideration is as valuable a contribution to the history of science as its predecessor. R. M.

Cina e Giappone. By E. von Hesse Wartegg. Translated into Italian by Captain Manfredo Camperio. Pp. 536; illustrated by 168 woodblocks, 72 plates, *facsimiles* of manuscripts, and one map. (Milan: Ulrico Hoepli, 1900.)

THE opening up of China to foreign commerce has naturally created a demand for books dealing with the country and its inhabitants considered from every aspect; their religion, their treatment of missionaries, their laws,

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their secret societies, their educational systems, their army, their monetary systems, postal arrangements, banks, theatres, and public institutions generally. This book is a traveller's account of the country, with no pretensions to be regarded as scientific; indeed, in reading the book with a view to matters of direct scientific interest, we have found nothing more noteworthy from this aspect than the description of the Chinese methods of performing calculations and of teaching arithmetic in schools. In connection with Japan, attention is called to the serious competition on the part of the Japanese, which threatens to undermine European commerce in the East; and the translator, as president of an Association for trading with the East, corroborates this view.

Europeans have been engaged by Japanese firms to teach them European methods of manufacture, and Japan is now sending out goods precisely similar to those of European make, and with the trade marks copied on them, and is able to sell them at lower prices than the Germans. It is particularly in the competition to supply the Chinese markets that Japan seems likely to outstrip Germany most effectually.

Practical Chemistry. Part i. By William French, M.A., F.I.C. Pp. xvi + 136. (London: Methuen and Co., 1900.)

An Introduction to Qualitative Analysis. By H. P. Highton, M.A. Pp. xii + 170. (London: Rivingtons, 1900.)

THE many excellent elementary text-books now available for students of chemistry ought to have a very distinct influence upon chemical teaching in schools. The two books under notice differ in several respects, but each is the work of a teacher who knows the capacity of a school curriculum for science, and the limitations as well as the capabilities of the human boy. Mr. French's book follows more or less closely the chemical subjects included in the syllabus of elementary physics and chemistry prescribed for Evening Continuation Schools. The syllabus is a reasonable one, and therefore it has been possible to describe a course of work which will meet with the approval of the advocates of rational methods of instruction in chemistry. Intelligent work in experimental science is now encouraged by the authorities of the University Local Examinations as well as the Education Department; and Mr. French's book provides a course of instruction which may be adopted with advantage, not only by teachers who have the requirements of examiners and inspectors in view, but who desire also to cultivate habits of observation and reasoning in their pupils.

Mr. Highton's book contains a carefully graduated course of practical chemistry which will serve as an introduction to simple qualitative analysis. It is not so distinctly a product of the "heuristic" movement as Mr. French's book, and is largely devoted to systematic analysis. The first part contains simple qualitative experiments and preparations leading up to analysis; while the second comprises all the metals and acid radicals not included in Part i., and met with in simple qualitative analysis. The third part deals with the separation and identification of the separate parts of a mixture of two or more simple salts. After a pupil has been taught to think, a course of practical chemistry such as this may be intelligently performed; but if he is introduced to chemistry by reagents and precipitates, the educational value of his work will be very small. Mr. Highton has succeeded in making a useful course of analytical work for boys preparing for examinations in practical chemistry.

Essai de Chronologie des Temps préhistoriques. By M. Roisel. Pp. 60. (Paris: Felix Alcan, 1900.)

AN essay in which evidence for three glacial epochs is made the basis of a division of the Quaternary period into seven distinct ages, extending from the year 88,000 B.C. to 6500 A.D.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Atmospheric Electricity.

FROM a paragraph in the "Notes" in NATURE of March 1 (vol. lxi. p. 422), it will be seen that the theory advanced by Mr. C. T. R. Wilson, of the Cavendish Laboratory, Cambridge, and recently supported by Elster and Geitel, of the origin of atmospheric electricity is gradually crystallising and becoming accepted, as might be expected when supported by such authorities. This theory is founded on the very beautiful and interesting experiments of these investigators, which show that there are ions in our atmosphere, and that these ions can form nuclei for the condensation of water vapour; and, further, that the negative ions become centres of condensation with a less degree of supersaturation than the positive ones, and consequently during condensation they will be the first to be carried down by precipitation, the positive ions being left in the atmosphere.

Before meteorologists accept this explanation of atmospheric electricity there are some points I would like to place before them for their consideration. These ions do not act as centres of condensation unless the air be highly supersaturated, whilst dust particles are active in saturated air, and some of them in air that is not quite saturated. So that before we can accept this theory of the electrification of the air we must be sure there is such a thing as dust-free air in our atmosphere; because if there is not there can be no such thing as the supersaturated air required to produce this separation of positive and negative ions.

Mr. Wilson is evidently conscious of this difficulty (*Phil. Trans.* vol. cxciii. pp. 289-308), as he adds a note to the end of his paper, in which he states that there is no evidence of supersaturation in the atmosphere; but he also says there is an equal lack of evidence against its existence; and whilst admitting it cannot exist in the lower dust-charged layers of the atmosphere, he is reluctant to give up the theory on that account, and supposes it may be possible that cloudy air may be purified of its dust as it ascends, by the dust particles becoming weighted by the vapour condensed on them, when they will fall, or the air may rise up through them and be dust-free when it escapes. Now any one who has been in clouds, or knows the slow rate at which cloud particles descend, will be aware that this process is an extremely slow one, and compared with movements of the cloud as a whole very insignificant. But suppose we give the cloud every chance to get free from its cloud particles: let it be kept quite still and free from eddies, and time allowed for all the water particles to fall out of it. Now what would be the condition of the air afterwards? Practically what it was before the cloud was formed. There would be a smaller number of dust particles in the air, but there would still be plenty to form a number of clouds in succession if the vapour supply was not exhausted. When a cloud forms in ordinary impure air, only a small proportion of the dust particles become active centres of condensation, whilst many receive no charge of vapour. On the Rigi Kulm (*Trans.* Roy. Soc. Edin. vol. xxxvii. Part iii. No. 28) I have counted as many as 3000 and 4000 dust particles per c c. in clouds, and on one occasion as many as 7700 in a dense cloud. Whilst in fog, which we may call a low-level cloud, I have observed as many as 50,000 dust particles per c.c. With thousands of dust particles in each cubic centimetre it is evident a cloud has dust nuclei sufficient for making a number of clouds should the first formed cloud particles be precipitated, as these dust particles will move with the air, whilst the cloud particles fall out.

No doubt clouds do not always have such large numbers of dust particles in them as the clouds above referred to, but cumulus clouds seem to be always pretty well supplied in that way, especially over continental areas. Then, as the quantity of water to be condensed is limited to the amount the cloud takes up with it from the surface of the earth—as it is not likely to have any vapour added to it unless it falls below the rain cloud level—there seems generally to be enough dust particles to condense all the water.

We must further remember that nature is economical in its use of these dust particles. If the cooling is taking place very rapidly, a large number of particles at once become active, but after a time a number of them lose their load of water by

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